

Where Measurement Begins



Tekran NG-80
Automated Hg Monitor



Tekran 2600-NG
Manual Hg Analyzer



Tekran 2642 Fixed
Sampling System



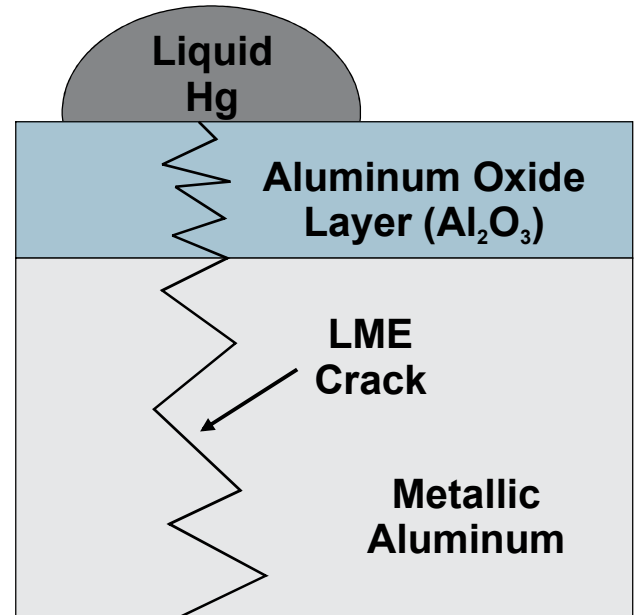
Tekran[®] Natural Gas Hg

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Tekran[®] 2537Xi-NG Automated Hg Analyzer

Why Measure Mercury

- Liquid mercury embrittlement (LME) will damage aluminum heat exchangers in LNG, hydrocarbon and petrochemical processing plants
- Shutdowns, costly repairs and fires have been documented due to mercury induced heat exchanger failure at processing plants
- Health hazard to workers from residual liquid mercury and vapors may increase cost and complicate plant maintenance
- LNG sales contracts have been cancelled when mercury levels exceed the set threshold



Mercury Sampling Methodologies

Method ASTM D6350-14

- Manual Method requiring CVAFS
- Requires 2 gold traps in series
- 1 ng/m³ detection limit required
- Requires multi-point calibration curve
- Recommends 100-200 ml/min flow & ~15 minute sample
- Minimal QA: Periodic breakthrough check, no acceptance criteria

Method ISO-6978-2

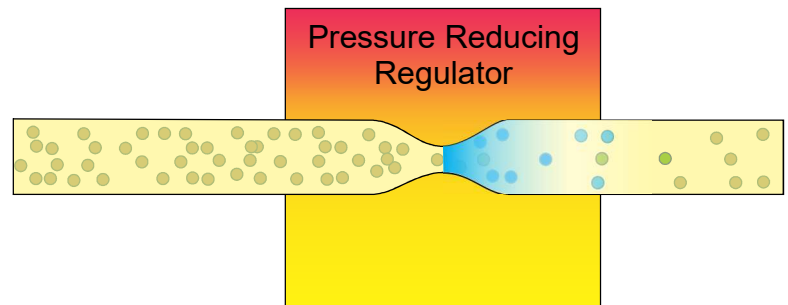
- Manual Method (CVAFS of CVAAS)
- Gold-coated quartz traps acceptable; two in series
- Requires heating of gold traps
- Multipoint Calibration with RSD <3% for each point
- QA – must test gold trap blank level
- QA - Trap efficiency checked with 10 ng spike and measurement

Natural Gas Sampling Challenges

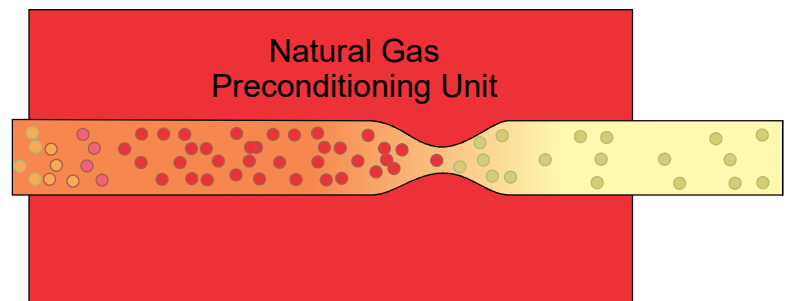
Mercury is the only heavy metal with a high vapor pressure that exists in the vapor phase at room temperature. Mercury vapor has a high affinity for metal, organic residues and other reactive surfaces. Sampling mercury from the complex natural gas sample matrix from a high-pressure pipeline creates a unique set of sampling challenges.

Primary Sampling Issues:

- Filtration: Particles in the NG matrix must be removed prior to sampling
- Surface Losses: Wetted surfaces must be coated with an inert material to prevent losses. Sampling through a system with constant diameter tubing, with no stagnant areas or dead legs, and an electro-polished surface to maintain laminar flow is critical for achieving a representative sample.
- Joule-Thompson Cooling: Large pressure let-down dramatically cools the sample gas, increasing the potential for condensation of Hg, water and other organics in the NG sample stream.



Traditional heated regulator creates cold spot at pressure letdown



Natural gas preconditioning eliminates pressure letdown effects

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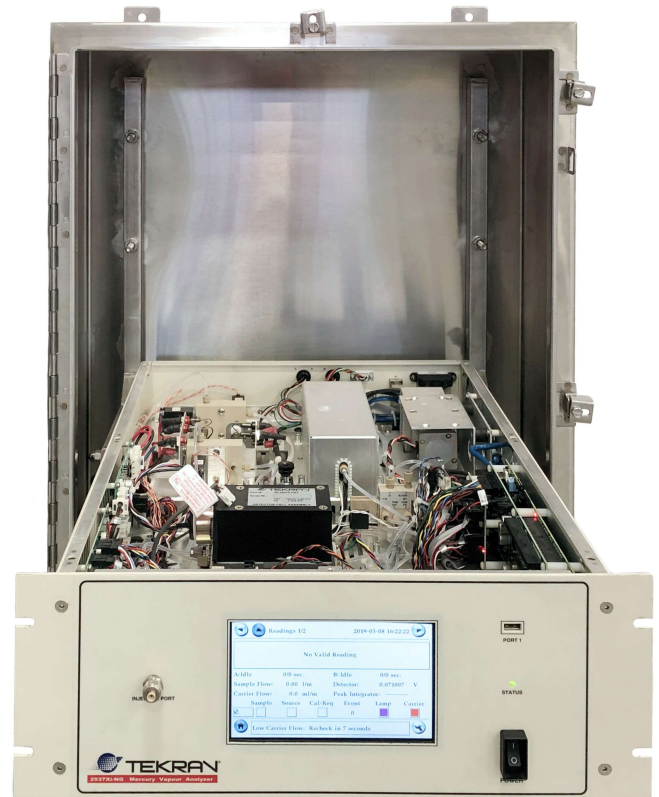


Natural Gas Analysis - Automated Systems

The Tekran Model 2537Xi-NG Mercury Monitor is designed for automated analysis of gas samples collected on gold-quartz traps. The system contains an atomic fluorescence detector, dual stage thermal desorption, data acquisition and control system. The system complies fully with ASTM-D6350 and ISO 6978 methods with built-in automated QA/QC method protocols. The analyzer is easily enclosed into purge cabinets (multiple configuration possible) for safe operation in hazardous environments.

Key Features:

- High sensitivity CVAFS Detector
- Complies fully with ASTM-6350 and ISO-6978
- Unique dual-bed gold-quartz trap and pure gold analytical cartridge
- Analytical cartridge never exposed to sample gas for clean operation
- Multiple automated QA routines validate method performance
- Range 1 ng/m³ to 2000 ug/m³
- Network enabled for remote operation



Tekran 2537Xi-NG w/ Purge Cabinet

Electronic & Detector Features:

- Touch screen HMI interface on outside of purge cabinet
- Local data storage and front panel USB port for data retrieval
- Additional functionality via optional s/w plugins (i.e. valve multiplexer)
- New lamp stabilizer and detector electronics w/ digital PMT control and display
- Easy cuvette removal via convenient fitting interface

Natural Gas Sampling Systems

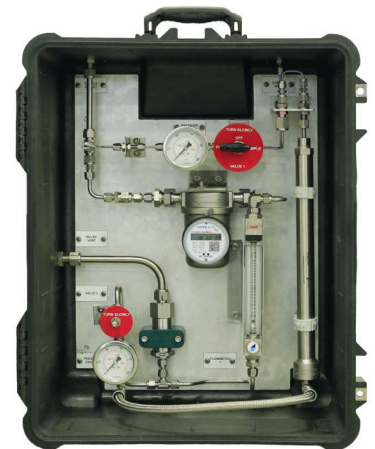
Natural Gas sampling is a critical component for accurate assessment of mercury in natural gas. Tekran has partnered with an industry leader in natural gas sampling technologies. We offer customers a comprehensive solution for sampling and analysis.

The Fixed Point Sampling System (Tekran Model 2642) is designed for permanent installation at one location. All wetted surfaces are both electro-polished and SilcoNert[®] coated to ensure 100% Hg transport. The 2642 also incorporates a gas pre-treatment device to filter the sample stream and eliminate Joule-Thomson cold-spots during pressure reduction. Sample performance improves with the addition of a custom probe with helical strakes to minimize vortex shedding and aerodynamic probe tip to actively reject particulate from the sample stream. The system includes a double block and bleed valve for safe sampling of high pressure gases. The sampling components are housed in a NEMA enclosure.



Fixed Point Sampling System (Tekran 2642)

The Manual Natural Gas Gold Cartridge Grab Sampler (Tekran Model 2641) is designed to be mobile for use at multiple sample points. The patented high-pressure sleeve holding the gold-quartz traps is designed for safe sample collection at line pressures. For added efficiency in the field, multiple high-pressure sleeves may be used to simplify sample collection and transport to the lab. Since mercury is collected on the gold-quartz trap at line pressure, the Joule-Thompson cooling occurs downstream of the collection trap, avoiding this sampling complication. All sample lines and surfaces upstream of the gold-quartz traps are electro polished and SilcoNert[®] coated.



Manual NG Gold Cartridge Grab Sampler (Tekran 2641)

Natural Gas Analysis - Accessories



The Tekran gold-coated quartz cartridge delivers high accuracy and precision, low carryover, and long operational lifetime. All coating, production and performance testing is carried out at the Tekran laboratory in Canada. The gold-quartz cartridges are provided with trace-clean Teflon sleeves and solid Teflon end plugs.

- Custom quartz beads normalize sorbent bed and minimize back pressure
- Individual blank and batch testing meets strict recovery and carryover criteria
- Each trap permanently marked with unique traceable identification numbers
- Optimized, high purity plasma deposition process

The Tekran Model 2505 Primary Calibration Source is a portable Hg vapor source used for calibration or quality control evaluation of analytical systems.

- Thermoelectric chiller - no water bath required
- Operates from 12 VDC or 120 VAC
- Precision temperature control - Resolution: 0.001 °C
- Hamilton[®] Digital Syringe used to provide accurate, NIST traceable injection volumes
- Microprocessor automatically calculates amount of mercury injected based on either measured or user entered temperature



Natural Gas Analysis - Automated Systems

Tekran 2537Xi-NG Natural Gas Monitor

- Complies with ASTM-6350 and ISO-6978
- Unique dual-bed gold-quartz trap and pure gold analytical cartridge with independent heater control
- Analytical gold cartridge never exposed to sample gas
- Network enabled for remote operation
- Multiple automated QA routines
- Range 1 ng/m³ to 2000 ug/m³



Electronics Platform and Detector Features

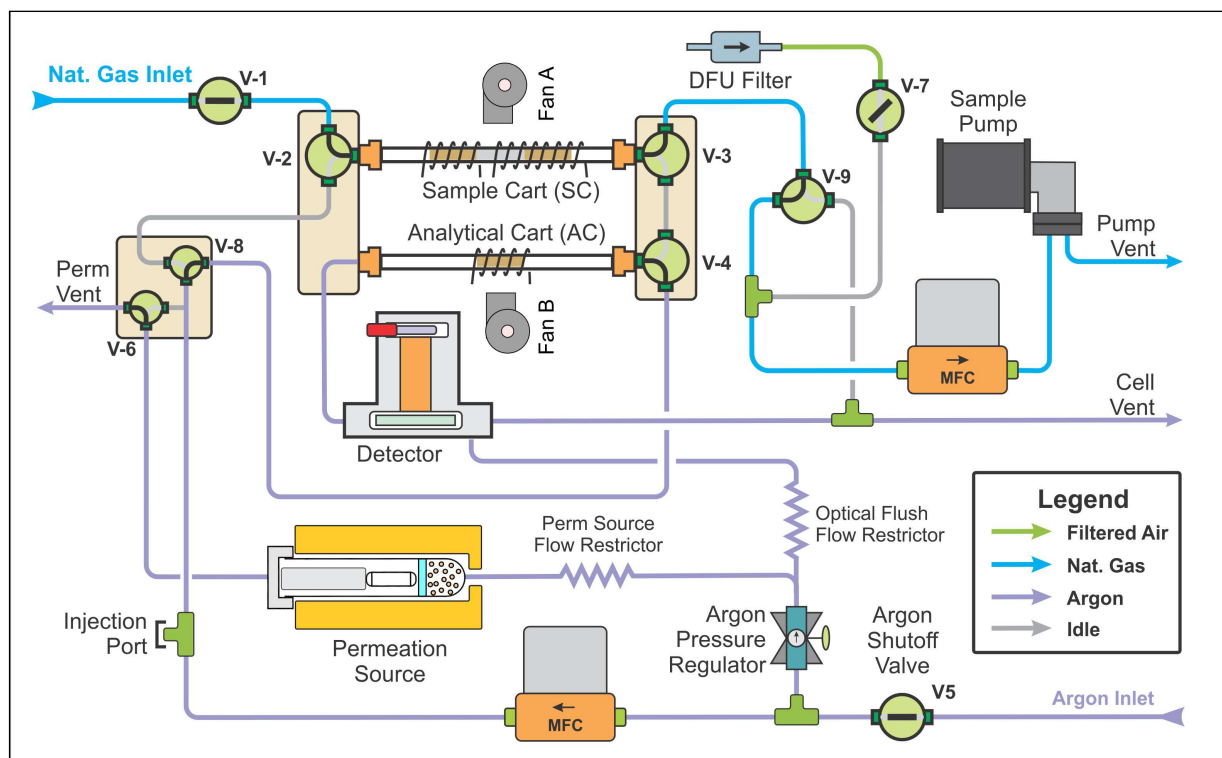
- Touch screen interface
- Local data storage and front panel USB port for data retrieval
- Additional functionality via optional firmware plugins (i.e. valve multiplexer)
- New lamp stabilizer and detector electronics with digital PMT control and display
- Easy cuvette removal via convenient fitting interface

Natural Gas Analysis - Automated Systems

Tekran 2537Xi-NG Quality Control

The Tekran 2537Xi-NG system has a built-in permeation source used to calibrate instrument response. The unique design of the 2537Xi-NG expands perm source function when performing ASTM D-6350 and ISO-6978 methods.

- Standard multipoint calibration of system
- Separate performance test of analytical pure gold cartridge
- Breakthrough test of primary dual-bed gold-quartz sample trap
- Post-sample matrix spike recovery testing



Conclusions:

- Sample transport design and performance is very critical to achieve data confidence needed for operations and economic decision making
- Manual methods are useful for process mapping using the Tekran 2600-NG Analyzer, gold-quartz traps and specialized natural gas sampling components
- Contact Tekran Instruments for more information about fulfilling your requirement for an automated, continuous monitoring system for mercury in natural gas